

# THE MINERAL INDUSTRY OF THE REPUBLIC OF KOREA

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Although the Republic of Korea's economy continued to grow in 2003, the growth rate was slower than that of 2002; the economic growth rate was 3.1%, less than one-half that of 2002 (Bank of Korea, 2004b). The gross domestic product (GDP) increased to \$605 billion, and per capita income rose to \$12,646. The manufacturing and mining sectors accounted for 22.1% and 0.5% of the GDP, respectively. Because of the increase in household debt, domestic consumption decreased sharply. Durable goods shipments contracted by 17%, and nondurable consumer goods shipments also declined by 5.5%. About 8% of the population was delinquent on credit card payments, which forced credit companies to cut credit lines; domestic analysts estimated that the delinquent rate was as high as 30% (Far Eastern Economic Review, 2004). The growth of the GDP was attributed to the increase in foreign trade. Net exports increased by about 90% and accounted for 2.8% of the growth rate. Because of the economic slowdown and rigidities in the labor market, the unemployment rate increased to 3.5% in December. Domestic demand gradually recovered at yearend. Exports of automobiles, electronics, and steel continued to maintain their growth as the global economy recovered. The Republic of Korea's economic growth was expected to increase in 2004 (Ministry of Finance and Economy, 2004, p. 3-14; Korea National Statistical Office, 2004§<sup>1</sup>).

Throughout the year, the Government continued to push financial reform and sold off some state-owned financial institutions. The Government revised and enacted financial legislation to strengthen protections for consumers and investors. The revision of the Bank Act, the Specialized Credit Financial Business Act, and the Enforcement Decree were introduced. The ailing insurance companies, mutual savings banks, and credit unions were rehabilitated through sales and mergers. Corporate restructuring had made significant progress, but one-quarter of Korean corporations were increasingly unprofitable and highly leveraged. A draft Consolidated Insolvency Law was submitted to the National Assembly for approval to give Koreans an appropriate legal basis to close corporations. The Government established the Korea Housing Finance Corporation to deal with the household debt issues. The Corporation would provide mortgages to people in need and help refinance short-term mortgage loans, thus reducing the risk of loan default. In 2004, the Government planned to reduce the special excise tax, which had been introduced in 1997 to levy more taxes on luxury items and services. The tax cut was designed to stimulate domestic consumption. In 2003, the Government, employers, and workers reached an agreement to improve the labor situation in the Republic of Korea. Under the terms of the agreement, labor unions will cooperate to stabilize general wage levels and to reduce confrontations between management and workers. Companies will increase investment and create new jobs. The Government continued its efforts to turn the country into the business hub of northeastern Asia. Two free economic zones, Busan/Jinhae and Gwangyang Bay, were designated in 2003 (Ministry of Finance and Economy, 2003; Bank of Korea, 2004a).

The Republic of Korea has limited mineral resources. The country requires imports of a variety of minerals to meet its increasing demand. Nearly 100% of the country's demand for such mineral resources as bituminous coal; copper, iron, lead, and zinc ores; fluorite; gypsum; magnesite; and phosphate were imported from other countries. Korea Resources Corp. (KRC) (a ministry-controlled company) planned to invest \$2.16 million to conduct feasibility studies on nine exploration sites in Australia, China, Indonesia, and Kazakhstan. KRC focused on such import-dependent minerals as coal, copper, lead/zinc, rare earths, and uranium (Korea Metal Journal, 2003b§).

The competition between China and the Republic of Korea over exports of ferrous and nonferrous metals and products has become more intense. China had increased its market shares of exports to the international market in the past several years. Because of huge investments and technology transfers from Japan and western countries, China had rapidly narrowed the gap with the Republic of Korea on production technologies. The Government urged metal producers to upgrade their production lines to produce high-value-added products to survive. These companies are expected to face increased competition from high-quality Japanese products and low-cost Chinese products in the international market (Korea Metal Journal, 2003a§).

In 2003, Korea's trade totaled \$372.6 billion. Exports rose by 19.3% to \$193.8 billion, and imports increased by 17.8% to \$178.8 billion. The United States was the Republic of Korea's largest trading partner followed by China, Japan, and Taiwan. China replaced the United States as the Republic of Korea's largest export market (Korea International Trade Association, 2004a§). Petroleum and raw materials accounted for about 55.4% of total imports, and metal products shared about 1% of total exports.

Effective on July 1, 2003, the import tariff rates on raw materials, which included coal, copper ore, iron ore, lead ore, manganese ore, titanium ore, zinc ore, and aluminum ingot, copper, nickel oxide, and pig iron were reduced. The normal import tariff rate on raw materials was 13%. The special tariff rate ranged from 0% to 3%. The industry urged the Government to apply a zero tariff on all imported raw materials that were noncompetitive to domestic producers to strengthen global competitiveness. The Government planned to submit an amendment to the National Assembly for approval to reduce the tariff rate to zero on raw materials for ferrous and nonferrous metal production at yearend (Korea Metal Journal, 2003d§).

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<sup>1</sup> References that include a section mark (§) are found in the Internet References Cited section.

In 2003, demand for downstream aluminum products, such as foil, extrusion, and sheet, was strong. The Republic of Korea relied entirely on imported aluminum ingot to meet downstream producers' demand. Imports of aluminum ingot increased by 7.5% to 844,072 metric tons (t). Aluminum ingot from China accounted for 40% of total imports followed by Australia (21%) and Russia (20%). Shares of aluminum products from China increased to 31.1% in 2002 compared with 27.5% in 2001 and 23.6% in 2000. During the same period, exports of aluminum products, which were mainly foils and sheet, to China also increased. Sales by Alcan Taihan Aluminum Co., Choil Aluminum Co., Namsum Aluminum Co., and Seoul Light Steel Co., which are major aluminum sheet producers, increased by a total of 13.6% in 2003 compared with those of 2002. Domestic sales of aluminum foil decreased by 5.4%, and exports increased by 12.7%, which resulted in a total sales increase of aluminum foil of only 0.4%. The high growth of aluminum foil and sheet exports was mainly attributed to the increased demand from China. The Republic of Korea's aluminum producers planned to expand their output capacities to meet China's demand (Korea Metal Journal, 2004a§, c§).

The Republic of Korea's copper market was quite active in 2003. With limited domestic copper resources, the country depended on import concentrates to meet its demand. In 2003, a total of 1.3 million metric tons (Mt) copper concentrates was imported from, in descending order, Chile, Indonesia, Argentina, Switzerland, Peru, and Guinea; Chile, which accounted for 31.4% of total concentrate imports, replaced Indonesia to become the major supplier. In 2003, domestic refined copper production increased slightly. Owing to the rising price of copper in the international market, especially in the second half of the year, refined copper imports decreased by 2% to 411,245 t; Chile was the major supplier. Refined copper exports increased by 171.1% to 39,765 t; China was the main destination. Because of increased domestic demand, the volume of unwrought copper exports declined in the last quarter. Owing to rising prices in the international market, the volume of copper scrap imports also decreased by 22% to 153,163 t, and the volume of exports increased by 176% to 94,054 t. Copper scrap was imported mainly from the United States and South Africa and was exported mainly to China. Domestic copper alloy producers had difficulty in securing high-grade copper scrap for their smelters. Copper alloy producers urged the Government to restrict the export of copper scrap; a large portion of copper scrap shipped to China, however, was the coated cable wire that was not recycled in Korea. In 2003, Korea consumed about 915,000 t of copper (Korea Metal Journal, 2003e§, 2004d§; Korea International Trade Association, 2004b§).

In the past several years, copper alloy producers had continuously expanded their output capacities despite domestic demand being slower than expected. Copper alloy producers from China and Japan had found ways to penetrate Korea's market. Imports of copper alloy from China and Japan had increased sharply in 2003. The competition in terms of price between domestic and import products was severe. Owing to the shortage of raw materials, high production costs, and sluggish demand, small copper alloy producers were forced to suspend production in 2003 (Korea Metal Journal, 2004d§).

Asia Gold Corp. of Canada decided to sell its 90% interest in its Korean activities to Hangum Co. Ltd. of Korea. The sale included Asia Gold's share of the Silver Hill (Eunsan) gold and silver mine. It received \$422,000 in cash and the sale of concentrate produced from the Silver Hill Mine until March 31, 2004. Asia Gold planned to devote more company resources to exploration projects in China and Mongolia (Asia Gold Corp., 2004).

According to the Korea Iron and Steel Association, crude steel production in the Republic of Korea has grown each year for the past 5 years and was the fifth largest crude-steel-producing country in the world following China, Japan, the United States, and Russia. The output of carbon steel from electric-arc furnaces (EAFs) increased by 1.1%, and the output from converters increased by 2.7% because Pohang Iron and Steel Co. Ltd. (POSCO) completed the renovation of No. 1 blast furnace in Gwangyang. Because of increased demand in the automobile, home appliance, and shipbuilding sectors, the consumption of steel increased by 4.8%. In 2003, the Republic of Korea produced more than 3.86 million automobiles and exported more than 2.56 million. Domestic automobile sales decreased by 19%. In the shipbuilding sector, the Republic of Korea increased its global market share to 43.5% in 2003 compared with 29.6% in 2002 and overtook Japan to become the leading shipbuilding country in the world. Because the shipment of steel products to China increased by 38.8% in 2003, the export of steel products increased by 9.5% to 15.1 Mt compared with that of 2002. Imports of steel increased by 10.4% to 15.6 Mt. The steel trade deficit resulted mainly from a substantial increase in imports of iron scrap and other raw materials used to produce steel products. The Republic of Korea depended heavily on the importation of iron scrap to meet domestic EAF demands. Crude steel from EAFs accounted for about 45% of the country's total output (Korea Metal Journal, 2004b§, f§, g§, j§).

During the next 5 years, POSCO planned to invest a total of \$11.3 billion to expand production capacity and to develop value-added products and FINEX (a next generation of ironmaking processing technology). The FINEX process was expected to save 15% of production costs compared with the blast furnace process. A FINEX pilot plant was inaugurated in early 2003, was scheduled to reach commercial production by 2005, and would replace small- and mid-sized blast furnaces. About 79% of the investment funds will be from the domestic steel sector, 16% from the overseas steel subsidiaries, and 5% from nonsteel sectors. The company intended to increase domestic crude steel output capacity to 32 Mt by applying the new steel technology developed by its research institute. POSCO planned to add a new steelmaking plant either in China, India, or one of the Southeast Asia countries. The reason for adding a steelmaking plant in one of these countries was to ease the constraint on upstream products for its subsidiaries. POSCO had four joint ventures in China and one in Vietnam (Metal Bulletin, 2004; Korea Metal Journal, 2003c§).

In 2003, POSCO completed the construction of its No. 3 stainless steel plant. The total investment was \$417 million, and major equipment was imported from SMS-Demag AG of Germany and Voest-Alpine AG of Austria. The company had a total stainless steel output capacity of 1.66 Mt from its three plants. POSCO also started the construction of its Nos. 5 and 6 continuous galvanizing lines in Pohang and Gwangyang, respectively. These two lines were scheduled to be completed in early 2006 and would add a total of 850,000 t in output capacity. At that time, the company would have a total galvanized sheet output capacity of 2 Mt (Korea Metal Journal, 2004h§).

INI Steel Co. announced that the company planned to invest \$117 million to build an 800,000-metric-ton-per-year (t/yr) H-beam plant in Dalian, China. INI estimated that H-beam demand in China would reach 10 Mt in 2010. According to the company's schedule, construction was to begin in May 2004, and the plant was to be put into operation in October 2005. The company also planned to expand output capacity to 1 million metric tons per year (Mt/yr) by 2008. INI will be the first Korean steel company to build a steel section plant in China (Korea Metal Journal, 2004e§).

The rising demand for nickel in the stainless steel sector forced the country to import more refined nickel. In 2003, nickel demand was estimated to be 100,000 t and was expected to increase by 9% in 2004. POSCO accounted for about 90% of the country's nickel consumption. Korea Nickel Corp. was a joint venture among Korea Zinc Co. Ltd., POSCO Steel Services and Sales Co. Ltd. (Posteel) (POSCO's trading company), and INCO Ltd. of Canada. Korea Zinc held 56% of shares; INCO, 25%; and Posteel, 19%. Korea Nickel had two electric furnaces with design output capacities of 32,000 t/yr and 16,500 t/yr. The company operated only the 32,000-t/yr furnace and used the 16,500-t/yr furnace as a stand-by unit because of the shortage of raw material supplies. Korea Nickel imported all its nickel oxide from INCO and sold its refined nickel domestically. Australia, Canada, and Russia were major refined nickel suppliers (Korea Zinc Co. Ltd., 2003, p. 32).

In 2003, the Republic of Korea consumed about 530,000 t of refined zinc, and the country's two zinc producers, Korea Zinc and its parent, Young Poong Corp., supplied less than 50% of the total consumption. Refined zinc imports were mainly from Australia where Korea Zinc's subsidiary Townsville, Queensland, zinc refinery was located. The Republic of Korea also imported zinc metal from North Korea, but the shipment was recorded as internal and was not reported in trade statistics. The Republic of Korea's zinc producers planned to raise their combined output by 5.7% in 2004 (Korea Metal Journal, 2004i§).

The Korean cement sector began to recover. In 2003, the country's cement output exceeded the 1997 level of 59.7 Mt. The cement consumption, however, remained below the 1997 level—58.3 Mt in 2003 compared with 61.7 Mt in 1997 (Korea Cement Industrial Association, 2004§). The Lafarge Group announced that it had acquired an additional 10.2% of its shares from State of Wisconsin Investment to become the majority shareholder (50.1%) of Lafarge Halla Cement Corp. At the same period, Lafarge sold all its shares in Tong Yang Cement Co. Ltd. to the Tong Yang Major Corp. for \$138 million. Tong Yang Cement was a joint venture between Lafarge and Tong Yang Major in 2001 (Lafarge Group, 2003).

Coal supplied about 20% of the total energy requirements. Most steam coal was imported, mainly from Australia and China, because the country produced low-quality anthracite, which was used for home heating and small boilers. Because of depleted resources and high production costs, coal production declined steadily during the past several years. The Government planned to close several coal mines in 2005. In 2003, the Republic of Korea imported 65.3 Mt of bituminous coal; China and Australia accounted for 40.6% and 38.7%, respectively, of the total imports (Korea International Trade Association, 2004c§).

The country relied on imported crude oil and natural gas to meet its fossil fuel demand. Hydrocarbons accounted for about 54% of total energy consumption in Korea. In November, state-owned Korea National Oil Corp.'s (KNOC) \$320 million Donghae-1 project began producing a small amount of natural gas. Donghae-1 gasfield, which is located 60 km off Ulsan in the Ulleung Basin, has about 200 billion cubic meters of gas. As part of inter-Korean economic cooperation, KNOC intended to take part in North Korea's oil exploration project, which is located offshore of the west coast (Asian Times, 2004§).

In 2003, POSCO and SK Power Co. Ltd. selected BP Indonesia to supply up to 1.35 Mt/yr of liquefied natural gas (LNG) from the Tangguh gasfield in Indonesia for 20 years starting in 2005. This had been the first LNG bidding process undertaken by private companies in the Republic of Korea. State-owned Korea Gas Co. held the exclusive rights to import LNG. POSCO is building an LNG-receiving terminal at Gwangyang. POSCO has two gas-fired powerplants, which are located in Gwangyang and Pohang; they have a total generating capacity of 845 megawatts (MW). SK Power will construct a 1,080-MW powerplant at Gwangyang (British Petroleum Co., 2003).

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## Major Sources of Information

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TABLE 1  
REPUBLIC OF KOREA: PRODUCTION OF MINERAL COMMODITIES <sup>1</sup>

(Metric tons unless otherwise specified)

Commodity	1999	2000	2001	2002	2003
<b>METALS</b>					
Bismuth, metal	108	71	106	69	116 <sup>e</sup>
Cadmium, smelter	1,791	1,911	1,879	1,827	2,175
Copper:					
Smelter <sup>e</sup>	370,000	410,000	410,000	410,000	460,000
Refined, primary and secondary	450,444	467,900	473,624	494,561	509,970
Gold, metal kilograms	25,730	22,605	28,595	26,181	40,262
Iron and steel:					
Iron ore and concentrate:					
Gross weight thousand tons	410	336	195	365 <sup>r</sup>	365
Fe content do.	230	188	109	164 <sup>r</sup>	161
Metal:					
Pig iron do.	23,329	24,938	25,898	26,570	27,314
Ferroalloys:					
Ferromanganese	140,208	146,373	143,525	137,000	141,000
Ferrosilicomanganese	116,091	103,522	101,877	94,000	--
Other	4,639	4,676	4,452	--	--
Total	260,938	254,571	249,854	231,000	141,000
Steel, crude thousand tons	41,042	43,107	43,852	45,390	46,310
Lead:					
Mine output, Pb content	1,822	2,724	988	28	--
Metal, smelter	143,583	170,704	161,000	178,722	169,297
Nickel	20,235	29,890	26,429	30,337	31,000 <sup>e</sup>
Silver, metal kilograms	488,792	591,130	664,533	973,140	947,781
Zinc:					
Mine output, Zn content	9,832	11,474	5,129	99	--
Metal, primary	429,766	473,897	503,315	600,027	644,218
<b>INDUSTRIAL MINERALS</b>					
Barite	--	30	--	--	--
Cement, hydraulic thousand tons	48,579	51,424	52,046	55,514	59,199
Clays, kaolin do.	1,858	2,098	2,384	2,831	2,500 <sup>e</sup>
Diatomaceous earth	30,222	34,143	27,530	20,666	15,636
Feldspar	409,334	330,417	389,361	415,580	477,012
Graphite, all types	62	65	65	94	58
Mica, all grades	24,733	65,249	109,339	29,870	33,645
Nitrogen, N content of ammonia	489,000	369,000	368,000	153,000	154,641
Salt <sup>e</sup>	750,000	800,000	800,000	800,000	800,000
Soda ash, manufactured <sup>e</sup>	310,000	310,000	310,000	310,000	310,000
Stone, sand and gravel:					
Limestone thousand tons	74,061	77,868	79,521	83,767	88,525
Quartzite do.	2,160	2,321	2,377	3,041	2,966
Sand, including glass sand do.	1,306	879	900	891	480
Sulfur, byproduct: <sup>e</sup>					
Metallurgy do.	528	572	665	680	690
Petroleum do.	600	600	600	610	610
Total do.	1,130	1,170	1,270	1,290	1,300
Talc and related materials:					
Pyrophyllite	754,657	917,973	1,101,825	889,961	912,285
Talc	15,313	11,344	47,712	37,863	47,911
<b>MINERAL FUELS AND RELATED MATERIALS</b>					
Carbon black	438,128	454,699	438,128	459,985 <sup>r</sup>	464,941
Coal, anthracite thousand tons	4,197	4,174	3,817	3,318	3,298
Fuel briquets, anthracite briquets <sup>e</sup>	13,000	13,000	13,000	13,000	13,000
Petroleum refinery products thousand 42-gallon barrels	897,373	911,761	930,000 <sup>e</sup>	940,000 <sup>e</sup>	950,000 <sup>e</sup>

<sup>e</sup>Estimated; estimated data are rounded to no more than three significant digits; may not add to total shown. <sup>r</sup>Revised. -- Zero.

<sup>1</sup>Table includes data available through June 1, 2004.

TABLE 2  
REPUBLIC OF KOREA: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Bismuth, metal	metric tons	Korea Zinc Co. Ltd.	Onsan	100
Cadmium	do.	do.	do.	2,000
Cement		Ssangyong Cement Industrial Co. Ltd.	Plants at Chandong, Kwang Yang, Mungyong, Pukpyong, and Yongwol	17,900
Do.		Sung Shin Cement Manufacturing Co. Ltd.	Tanyang plant	13,700
Do.		Tong Yang Major Corp.	Plants at Pukpyong and Samchok	12,600
Do.		Lafarge Halla Cement Corp.	Plants at Kwang Yang and Okkye	9,500
Do.		Hyundai Cement Co. Ltd.	Plants at Tanyang and Yongwol	8,600
Do.		Hanil Cement Manufacturing Co.	Plants at Chungbuk and Tanyang	7,900
Do.		Asia Cement Manufacturing Co. Ltd.	Plants at Daegu and Jaechon	4,600
Coal		Korea Coal Corp.	Mines at Changsung, Dogae, and Hwasoon	2,000
Copper, metal, primary		Korea Zinc Co. Ltd.	Onsan	4
Do.		LG-Nikko Copper Inc.	Changhang	60
Do.		do.	Onsan	460
Gas, natural		Korea National Oil Corp.	Ulleung Basin	NA
Gold:				
In concentrate	kilograms	Ivanhoe Mines Ltd.	Haenam, Cholla Province	1,600
Refined	do.	Korea Zinc Co. Ltd.	Onsan	50,000
Graphite		Kaerion Graphite Ltd.	Kangwon	NA
Do.		Wolmyong Mining Co.	do.	NA
Lead, metal, primary		do.	do.	200
Nickel, metal		Korea Nickel Corp.	do.	51
Silver:				
In concentrate	kilograms	Ivanhoe Mines Ltd.	Haenam, Cholla Province	3,700
Refined	metric tons	Korea Zinc Co. Ltd.	Onsan	1,000
Steel, crude		Pohang Iron and Steel Co. Ltd.	Kwangyang plant	15,000
Do.		do.	Pohang plant	13,000
Do.		INI Steel Co.	Donggu plant	4,750
Do.		do.	Pohang plant	3,140
Do.		Dongkuk Steel Mill Co. Ltd.	Inchon Works	1,450
Do.		do.	Pohang Works	3,600
Do.		Kia Steel Co. Ltd.	Kunsan	720
Talc		Dongyang Talc Mining Co.	Chungju Mine	NA
Zinc, metal, primary		Korea Zinc Co. Ltd.	Onsan	400
Do.		Young Poong Corp.	Sukpo	200

NA Not available.